Update of Nutrient Threshold Development in New Mexico, 2012

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New Mexico Stream Work to Date

- **Developed a weight of evidence nutrient assessment protocol for streams - using threshold values for both cause and response variables**

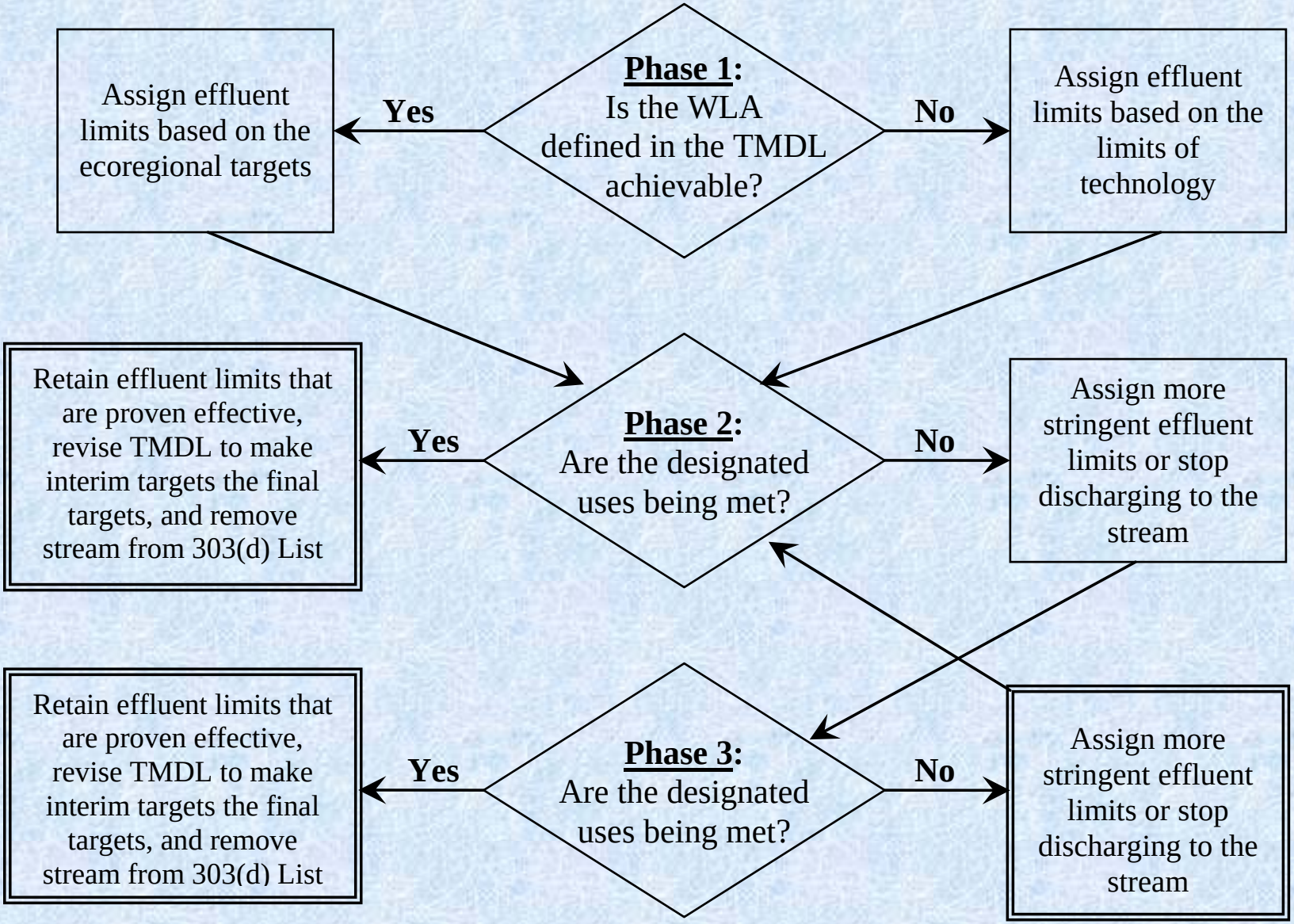
- **Using this protocol since 2002 to assess stream segments -**
  - **42(check with Lynette) stream segments**
  - **962.22 miles**
  - **13% of all impairments / third leading cause**

- **TMDLs – 31 completed to date; 1 pending approval; 12 anticipated in the near future**

- **NPDES Permits with nutrient effluent limits have been developed with the ecoregional threshold values as TMDL Targets – 8 current; 12 more anticipated in the near future**

Implementing Nutrient Control Strategies

NM is using a phased approach for setting nutrient permit limits in TMDLs



Recognizing that the water-quality based, ecoregional targets defined in the TMDL are unachievable, the phased approach uses the limits of technology to set effluent limits

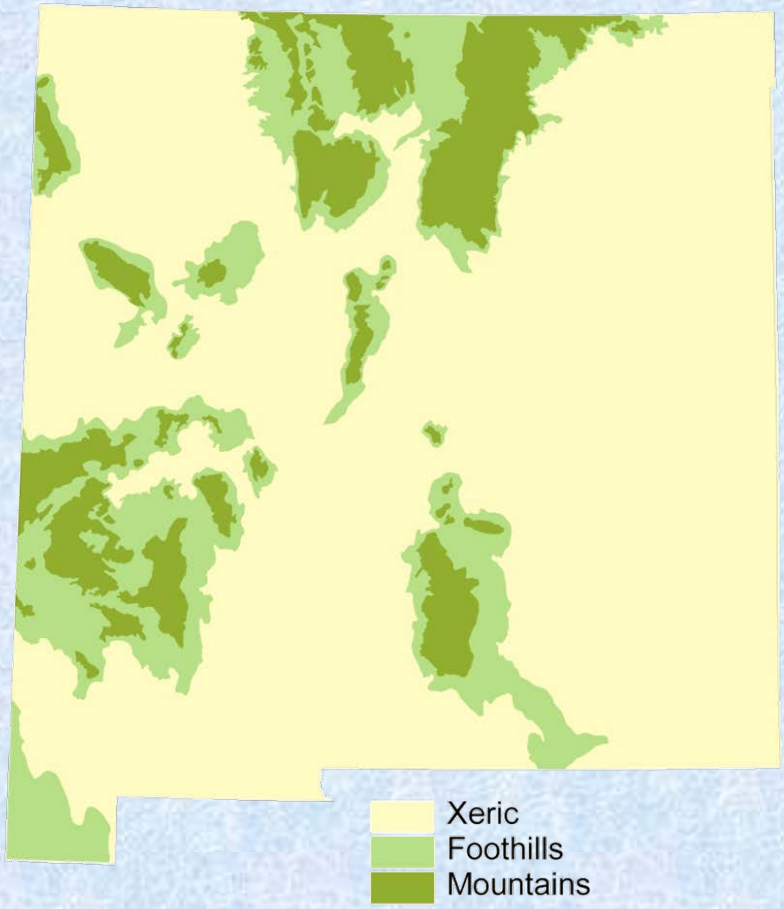
WWTP	**Nutrient effluent limits[a] (no more stringent than)**
New facility [b]	TN = 3.0 mg/L and TP = 0.1 mg/L
Upgrade/expansion of existing facility or increase in design capacity [b]	TN = 3.0 mg/L and TP = 0.1 mg/L
Existing facility (no expansion/increase in design flow)	TN = 8.0 mg/L and TP = 1.0 mg/L

(a) Effluent limits are annual averages that are designed to help communities begin the process of converting their WWTPs for nutrient removal. Literature indicates these limits are technologically achievable

(b) Biological treatment is highly temperature dependent therefore the permit may need to consider seasonal targets based on WWTP design.

Ongoing work

As data are added and other classification systems developed, and as more indicators become available (e.g. benthic macroinvertebrate metrics), SWQB will continue to refine the threshold values.



NEXT STEP: Compile historic benthic macroinvertebrate data and analyze metrics and other nutrient variables

Lakes and Reservoirs

Lakes Dataset

- In 2006 and 2007, SWQB sampled 25 lakes and reservoirs, including cirque lakes, sink holes, and warm and coldwater reservoirs for the following parameters
  - Total Phosphorus
  - Total Kjeldahl Nitrogen
  - Nitrate Plus Nitrite
  - Secchi depth
  - Chlorophyll *a* concentration
  - Phytoplankton Community Comp
  - Dissolved Oxygen
- Water quality data from 2000-2007 was compiled from the SWQB Database
- Water quality data from 1980-1999 was downloaded from Archival STORET

Data mining effort resulted in the following:

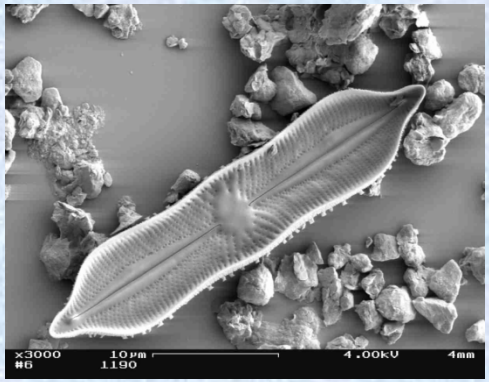
- Water quality data from 1989 through 2007
- 406 sample events from 107 sites on 78 lakes and reservoirs
- The proportion of Cyanophytes (i.e. blue-green algae) was determined for the 123 sample events with phytoplankton data
- DO profile was summarized 3 ways: average of the top and bottom 3 m and the proportion of the profile below the standard (DO not shown to be useful indicator of eutrophication)

Growing Season
for ecoregion and elevation classes

(not as useful as anticipated & will not be used in assessments)

"The relationship between total P and the abundance of cyanobacteria in the phytoplankton was stronger when data were limited to summer months, but resulted in an identical threshold value (0.045 mg/L)"

In some cases the highest Chlorophyll *a* concentrations occurred outside the growing season (23% of non-growing season samples had the highest seasonal chlorophyll).



Data Analysis

- Percentiles of nutrient indicators for different classes of reservoirs were calculated

- Changepoint and Regression Tree Analyses were used to identify environmental thresholds that result in an ecological change (i.e. thresholds at which biological or chemical data exhibit a clear change in either magnitude or variability)

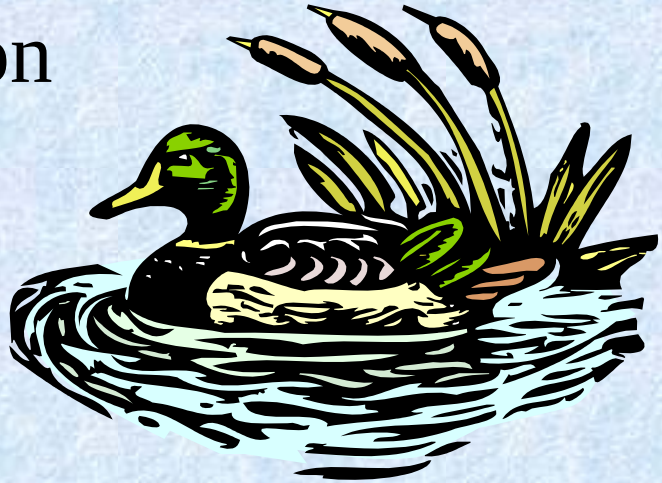
Thresholds from various analyses of lake data

	SWQB		UAR			EPA	
	CWAL	WWAL	CWAL	WWAL	ALL Lakes	West Mtn.	Xeric West
	50th percentile	50th percentile	Change point			25th percentile	25th percentile
Total Phosphorus (mg/L)	0.03	0.04	0.038	0.042	0.045	0.088	0.017
Total Nitrogen (mg/L)	0.5	0.6	0.89	1.13	1.19	0.1	0.4
Secchi Depth (m)	1.5	1.0				4.5	2.7
Chlorophyll *a* (µg/L)	2.3	3.2				1.9	3.4

Lake Assessments

Will use multiple lines of evidence including the following indicators:

- Total Nitrogen
- Total Phosphorus
- Chlorophyll *a* concentration
- % Cyanobacteria
- Secchi depth



Rivers

NM River Data

- SWQB compiled the historic river dataset of nutrient parameters
- This effort resulted in a good dataset of cause variables (n ~ 3000) but few response variables
- Diurnal DO Flux data were also compiled and in the process of calculating Pmax and Rmax
- One step closer to getting historic benthic dataset into a useful format (ongoing frustration)

Preliminary analysis of large river dataset yielded the following results:

- Ranges of 50th percentiles for the different rivers:

  TP - 0.02 - 0.09 mg/L

  TN - 0.4 - 0.8 mg/L

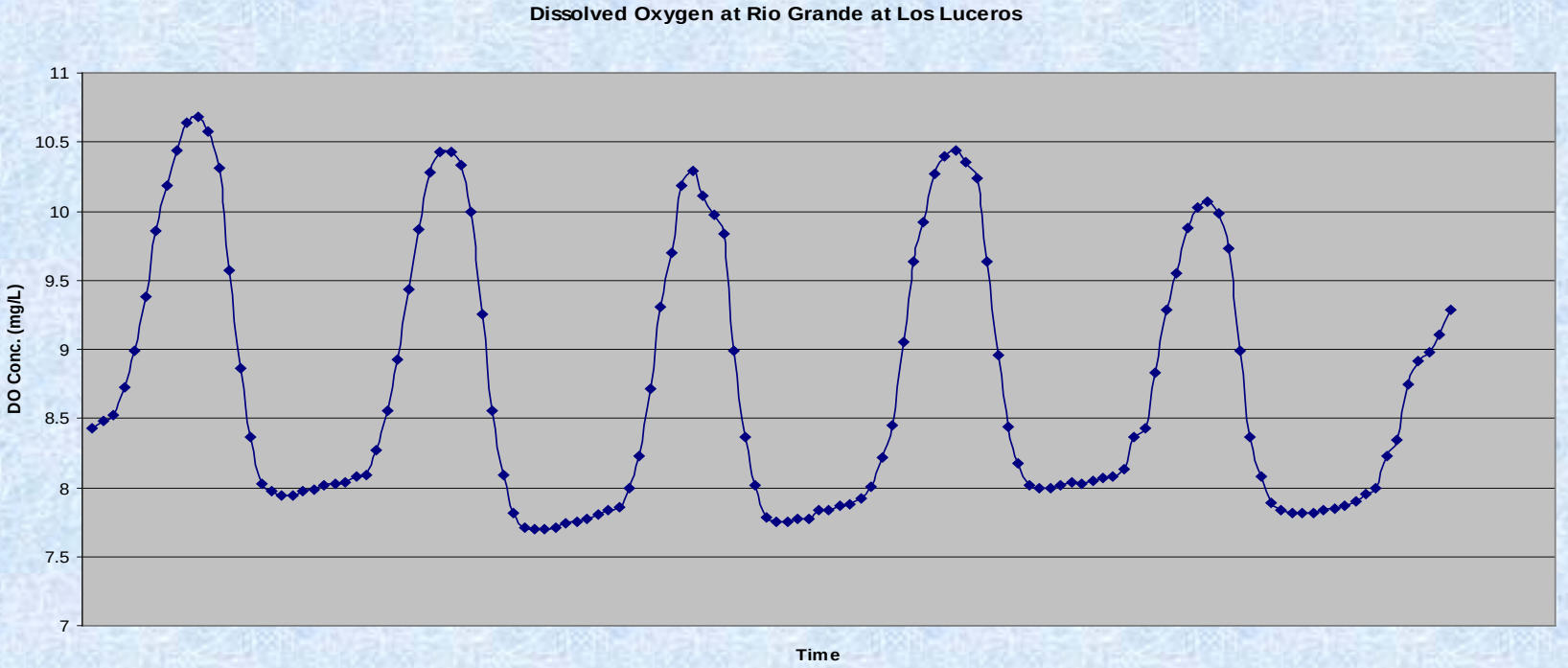
- Changepoint and Regression Tree Analyses resulted in the following thresholds:

  TP 0.020 - 0.028 mg/L

  TN 0.34 - 0.42 mg/L

Stream Metabolism

- Pmax = maximum estimated rate of primary production, in grams of oxygen per cubic meter per hour (determined by calculating the slope of the DO concentrations between 9:00 a.m. and 3:00 p.m)
- Rmax = maximum estimated rate of respiration, (determined by calculating the DO slope between 7:00 p.m. and midnight)



Next steps for large river thresholds

- compile benthic macroinvertebrate metric data and analyze with other nutrient variables
- compile stream metabolism data and analyze with other nutrient variables
- incorporate the resulting thresholds into a weight of evidence assessment protocol

General Approach

- New Mexico has undertaken an effective approach to address nutrient impairments through application of our narrative standard

- SWQB will continue to use the threshold values in assessment protocols to identify nutrient impaired waterbodies and implement nutrient control strategies including incorporation of a phased approach that uses the limits of technology to set preliminary effluent limits

- Without significant increase in federal funds, SWQB will not pursue the development and adoption of numeric nutrient criteria

- If adoption of nutrient criteria is undertaken in the future it will likely follow the approach of Maine and Ohio where both cause and response variables are incorporated into the criteria

Questions?

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